



REMARKS

Status of the Application.

With entry of the instant amendment claims 2, 5, 7 - 10, 14 and 29 - 41 are pending. Claims 2, 5, 7, 8 and 14 have been amended, and claims 29 - 40 are new. Claims 1, 3, 11- 13 and 16 - 28 have been canceled. Applicants reserve the right to file further continuation and/or divisional applications on the embodiments embraced by the canceled claims. New matter has not been introduced by the amended or new claims. Applicants have appended hereto Appendix I, a marked-up version of the specification; Appendix II, a marked-up version of the amended claims; and Appendix III, a clean claim set.

The dependency of claims 5, 7 and 14 has been changed. These claims now depend from claim 2. Claim 2 and claim 8 have been amended as independent claims, which incorporate the limitations of now canceled claim 1. Additionally, the preamble of the claims has been changed to recite a reduced allergenic variant of a polypeptide of interest and the claims are directed to a variant having a lessened allergenic response in an individual. Support is found *inter alia* in the original claims and at page 30, second full paragraph of the specification.

New dependent claims 29, 31 and 33 are directed to specific enzymes that are listed in the Markush grouping of claim 2. Claims 30, 32 and 34 recite specific T-cell epitopes as SEQ ID NOs:. Claim 35 is a new independent claim directed to a hybrid protease variant, wherein a protease of interest comprises a T-cell epitope and the T-cell epitope is altered by having a terminal portion of the protease comprising the T-cell epitope replaced with a corresponding terminal portion of a homolog of said protease of interest wherein said homolog does not comprise a T-cell epitope identical to the replaced T-cell epitope and wherein the variant produces a lessened allergenic response in an individual compared to the protease of interest. Claims 36 and 37 depend from claim 35 and are directed to subtilisin as the protease and a specific hybrid protease, respectively. Support is found in example 6 and at page 16, line 26 through page 17, line 10 of the disclosure.

Claims 38 - 40 are directed to compositions comprising the variant of claims 8, 2 and 35 respectively. Claims 39 and 40 are directed to cosmetic formulations for skin, hair or oral care, and support is found at page 5, lines 23 - 27 of the disclosure. New independent claim 41 is directed to a reduced allergenic variant of a polypeptide of interest wherein at least two amino

acid residues are modified in the T-cell epitope of the polypeptide of interest. Support may be found in original claims 1 and 7 and page 30 of the specification.

see also to

Objection to the specification.

The Examiner has objected to the disclosure because 1) at page 22, the "R factor" is not defined by any formula, and 2) numerous exponent values have not been indicated as exponents in example 1. As pointed out by the Examiner, the parent application is incorporated by reference in its entirety, and therefore the defects in this application may be corrected according to what is recited in the parent. Applicants have added the formula for the R factor and the exponents for example 1 as disclosed in the parent application. Additionally, "CD4+" has been rewritten as "CD4*" throughout example 1. Example 1 of the parent application is the same as example 1 of the instant application.

Rejections under 35 U.S.C. §112, first paragraph.

Claims 1, 2, 5, 7 - 10 and 14 have been rejected under 35 U.S.C. §112, first paragraph. The Examiner states,

"Applicant has not given an adequate description of what is meant by a different immunogenic response" (as in claim 1) or even such a response as interpreted as "less" (as in claim 2)."

Additionally, the Examiner states,

"the specification, while being enabling for providing enzyme variants which produce a lessened allergenic response, does not reasonably provide enablement for providing enzyme variants which produce an altered or lessened immunogenic response of any and all types."

Claim 1 has been canceled, and amended claim 2 recites a variant having a lessened allergenic response in an individual compared to the polypeptide of interest. Applicants submit the amendment to claim 2 renders moot the rejection of claims 2, 5, 7 and 14 under the first paragraph of section 112.

With respect to the rejection of claims 8 - 10, the Examiner states,

"Applicant's disclosure has not adequately described what are sequences from homologues to the protease of interest that are

sequences which produce an altered or lesser immunogenic or allergenic response."

Applicants submit the disclosure does adequately describe what sequences from homologues would produce a lesser allergenic response. The disclosure teaches how to identify T-cell epitopes of a protein of interest; how homologous sequences can be determined using for example sequence comparison algorithms; and how to modify a protein of interest. Further, once an epitope is identified, one of ordinary skill in the art can use established protein engineering techniques to construct the hybrid. Particularly with reference to protease, one of ordinary skill in the art is well aware of methods to determine homology. Reference is made to page 19, line 23 through page 22. Also as taught in Example 6, after T-cell epitopes were determined in the protease GG36 (Figure 16) and BPN' (Figure 17) a hybrid protease was constructed (Figure 18) wherein the first 122 amino acids of the hybrid protease were derived from GG36 and the remaining amino acid sequence was derived from BPN'. The hybrid protease (GG36 - BPN') is disclosed in SEQ ID NO: 236 and claimed in claimed 37.

Establishment of Effective filing date.

The Examiner has stated the Markush group of claim 1 was not disclosed in the parent application. Also it is alleged that the notion of a "different immunogenic response" as opposed to a lessened immunogenic response, and further the concepts of claims 8 - 10 were not disclosed in the parent application. The pending claims are directed to a lessened allergenic response. The parent application clearly teaches a method of identifying the T-cell epitopes in a protein of interest, and while the parent application only had specific examples directed to variants of a protein of interest wherein the protein was a protease, the disclosure teaches the invention extends to all proteins for which it is desired to reduce allergenicity. It was additionally taught that the protein of interest could be an amylase (page 7, line 22). The current application includes specific examples for cellulase -example 3; lipase - example 4; endogluconase-example 5, and the hybrid protease - example 6.

Rejection under 35 U.S.C. §§102(b) and 103(a)

Claims 1, 2, 5 and 7 have been rejected under 35 U.S.C. §102(b) as anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious over King (US 5,593,877). The Examiner states,

"that King teaches identification of T-cell epitope sites in phospholipase or hyaluronidase allergens found in insect venom, and immunomodulatory peptides containing the identified T-cell epitopes which can be therapeutically administered to patients..... The peptides can be modified by amino acid substitutions or by chemical treatment."

Applicants assert the reference does not teach or suggest the presently claimed invention. King relates to nucleic acids encoding phospholipase and hyaluronidase vespid venom enzymes, fragments thereof and expression vectors and pharmaceutical compositions comprising these peptides. Additionally the reference discloses that the invention relates to immunomodulatory derivatives of the phospholipase and hyaluronidase enzymes (col. 17, lines 54 - 58). The term immunomodulatory as used in the reference refers to an ability to increase or decrease an antigen-specific immune response at either the B cell or T cell level (col. 9, line 65 - col. 10, line 7). This disclosure does not teach or suggest to one skill in the art a variant of a polypeptide of interest wherein an identified T-cell epitope of the polypeptide of interest is altered by modification of one or more amino acid residues in the T-cell epitope such that the variant is less allergenic in an individual than the polypeptide of interest. While, column 17 - 18 discloses that derivatives can be made by altering the nucleic acid sequences of the invention by substitutions, additions, or deletions that provide for functionally equivalent molecules, there is still no teaching of altering a T-cell epitope to produce a variant as claimed by the invention.

For a reference to anticipate Applicants' disclosure each and every element must be presented in the reference. King fails this test. Moreover Applicants take the position there is no prima facie case of obviousness for the instant claims over King. A consistent criteria for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art to do what Applicants have done and would have a reasonable likelihood of success. Both the suggestion and the expectation of success must be founded in the prior art reference. Applicants assert both the suggestion and the expectation of success are lacking in the King reference.

Claims 1, 2, 5 and 7 have been rejected under 35 U.S.C §102(b) as being anticipated by Seikstra et al. (WO 96/34946) or (US 5,837,517) or Bott et al., (EP 0,251,446) or (US 5,801,038). The Examiner states both prior art references disclose a single substitution at position Y171Q and the substitution would inherently produce a less allergenic subtilisin than the native form of the enzyme.

Seikstra et al. is concerned with a subtilisin variant having improved storage stability and/or improved performance in detergents. The variant includes the substitution of one or more amino acids located in or situated in the vicinity of a hydrophobic domain of a parent subtilisin. The amino acid substitution must be with a residue more hydrophobic than the original residue. The reference does not teach or suggest a reduced allergenic variant of a parent protein having one or more amino acid residue modifications in an identified T-cell epitope wherein the variant is less allergenic to an individual than the parent protein. It is not inherent that a class of subtilisin variants having improved storage stability and/or improved performance in detergents wherein certain amino acid residues are modified to be more hydrophobic than an original amino acid in a corresponding position would also include reduced allergenic variants as claimed by Applicants.

Bott et al. is concerned with mutant subtilisins which are derived from a precursor subtilisin. These mutants may have single and multiple amino acid substitutions. As disclosed in Tables 1 and 2 and at column 15 of the reference, each of the mutant subtilisins listed were chosen to probe the influence of such substitutions on various properties. These properties do not include a modified allergenic response in humans. As stated at column 15, Met124 and Met222 were identified as important residues which if substituted with another amino acid produced a mutant subtilisin with enhanced oxidative stability. Other specific residues were identified as being important with regard to substrate specificity and these included Y104, A152, E156, G166, G169, F189 and Y217. The reference does not disclose or teach a protease having an identified T-cell epitope wherein the epitope is modified by one or more amino acid residues to produce a variant that has a reduced allergenic response in an individual compared to the parent protease.

Provisional Obviousness-Type Double Patenting Rejection

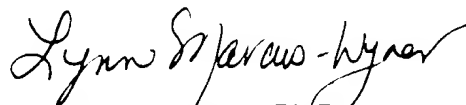
The Examiner has provisionally rejected claims 1, 2, 5, 7 - 9 and 14 as being unpatentable over claims 15 - 22 of copending Application No. 09/255,501 and as being unpatentable over claims 5, 24, 27 and 30 of copending application No. 09/060,854. Applicants respectfully request that the double patenting rejection be held in abeyance until there is agreed upon patentable subject matter in the present application, and then, if appropriate, Applicants would be willing to file a terminal disclaimer.

Status of the Sequence Listing.

The Examiner has indicated that the CFR filed June 18, 2001 contains errors. Applicants' file is missing a copy of the error report, and Applicants have requested another copy. Once this is received Applicants will correct the errors.

In light of the above remarks, Applicants respectfully request the withdrawal of all pending rejections. Pending claims 2, 5, 7 - 10, 14 and 29 - 41 are in condition for allowance and issuance of a formal Notice of Allowance at an early date is respectfully requested. If a telephone conference would expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (650) 846-7620.

Respectfully submitted



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Date: February 27, 2002

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Enclosures: Appendix I - Mark-up version of the specification
Appendix II - Marked-up version of the amended claims
Appendix III - Clean claim set



APPENDIX I - Marked-up Copy of the Specification

Example 1

Assay for the Identification of Peptide T-Cell Epitopes
Using Naïve Human T-Cells

Fresh human peripheral blood cells were collected from "naïve" humans, i.e., persons not known to be exposed to or sensitized to *Bacillus lentus* protease, for determination of antigenic epitopes in protease from *Bacillus lentus* and human subtilisin. Naïve humans is intended to mean that the individual is not known to have been exposed to or developed a reaction to protease in the past. Peripheral mononuclear blood cells (stored at room temperature, no older than 24 hours) were prepared for use as follows: Approximately 30 mls of a solution of buffy coat preparation from one unit of whole blood was brought to 50 ml with Dulbecco's phosphate buffered solution (DPBS) and split into two tubes. The samples were underlaid with 12.5 ml of room temperature lymphoprep density separation media (Nycomed density 1.077 g/ml). The tubes were centrifuged for thirty minutes at 600G. The interface of the two phases was collected, pooled and washed in DPBS. The cell density of the resultant solution was measured by hemocytometer. Viability was measured by trypan blue exclusion.

From the resulting solution, a differentiated dendritic cell culture was prepared from the peripheral blood mononuclear cell sample having a density of [108] 10^8 cells per 75 ml culture flask in a solution as follows:

- (1) 50 ml of serum free AIM V media (Gibco) was supplemented with a 1:100 dilution beta-mercaptoethanol (Gibco). The flasks were laid flat for two hours at 37 °C in 5% [CO2] CO_2 to allow adherence of monocytes to the flask wall.
- (2) Differentiation of the monocyte cells to dendritic cells was as follows: nonadherent cells were removed and the resultant adherent cells (monocytes) combined with 30 ml of AIM V, 800 units/ml of GM-CSF (Endogen) and 500 units/ml of IL-4 (Endogen); the resulting mixture was cultured for 5 days under conditions at 37 °C in 5% [CO2] CO_2 . After five days, the cytokine [TNF α] TNF α (Endogen) was added to 0.2 units/ml, and the cytokine [IL-1 α] IL-1 α (Endogen) was added to a final concentration of 50 units/ml and the mixture incubated at 37 °C in 5% [CO2] CO_2 for two more days.
- (3) On the seventh day, Mitomycin C was added to a concentration of 50 microgram/ml was added to stop growth of the now differentiated dendritic cell culture.

The solution was incubated for 60 minutes at 37°C in 5% **[CO2] CO₂**. Dendritic cells were collected by gently scraping the adherent cells off the bottom of the flask with a cell scraper. Adherent and non-adherent cells were then centrifuged at 600G for 5 minutes, washed in DPBS and counted.

(4) The prepared dendritic cells were placed into a 96 well round bottom array at **[2x10⁴/well] 2x10⁴/well** in 100 microliter total volume of AIM V media.

[CD4+] CD4⁺ T cells were prepared from frozen aliquots of the peripheral blood cell samples used to prepare the dendritic cells using the human **[CD4+] CD4⁺** Collect Kit (Biotex) as per the manufacturers instructions with the following modifications: the aliquots were thawed and washed such that approximately **[108] 10⁸** cells will be applied per Collect column; the cells were resuspended in 4 ml DPBS and 1 ml of the Cell reagent from the Collect Kit, the solution maintained at room temperature for 20 minutes. The resultant solution was centrifuged for five minutes at 600G at room temperature and the pellet resuspended in 2 ml of DPBS and applied to the Collect columns. The effluent from the columns was collected in 2% human serum in DPBS. The resultant **[CD4+] CD4⁺** cell solution was centrifuged, resuspended in AIMV media and the density counted.

The **[CD4+] CD4⁺** T-cell suspension was resuspended to a count of **[2x 10⁶/ml] 2x10⁶/ml** in AIM V media to facilitate efficient manipulation of the 96 well plate.

Peptide antigen is prepared from a 1M stock solution in DMSO by dilution in AIM V media at a 1:10 ratio. 10 microliters of the stock solution is placed in each well of the 96 well plate containing the differentiated dendritic cells. 100 microliter of the diluted **[CD4+] CD4⁺** T-cell solution as prepared above is further added to each well. Useful controls include diluted DMSO blanks, and tetanus toxoid positive controls.

The final concentrations in each well, at 210 microliter total volume are as follows:

[2x10⁴] 2x10⁴ [CD4+] CD4⁺

[2x10⁵] 2x10⁵ [dendritic] dendritic cells (R:S of 10:1)

5 mM peptide



APPENDIX II - Marked-up Copy of the Amended Claims

- 2.(Once amended) **[The variant of claim 1] A reduced allergenic variant of a polypeptide of interest, wherein said polypeptide of interest is selected from the group consisting of a cellulase, lipase, endoglucosidase H, carbohydrase, reductase, oxidase, isomerase, transferase, kinase, phosphatase and a protease and said polypeptide of interest comprises a T-cell epitope, wherein said variant differs from said polypeptide of interest by having an altered T-cell epitope such that one or more amino acid residues of the T-cell epitope are altered and wherein an allergenic [wherein said] immunogenic response produced by said variant in an individual is less than said allergenic immunogenic response produced by said polypeptide of interest.**
- 5.(Once amended) The variant of **[claim 1] claim 2**, wherein said polypeptide of interest is not recognized by said individual as endogenous to said individual.
- 7.(Once amended) The variant of **[claim 1] claim 2**, wherein said T-cell epitope is altered with amino acid substitutions.
- 8.(Once amended) **[The variant of claim 1] A reduced allergenic variant of a polypeptide of interest, wherein said polypeptide of interest is selected from the group consisting of a cellulase, lipase, endoglucosidase H, carbohydrase, reductase, oxidase, isomerase, transferase, kinase, phosphatase and a protease and said polypeptide of interest comprises a T-cell epitope, wherein said variant differs from said polypeptide of interest by having an altered T-cell epitope such that an allergenic immunogenic response produced by said variant in an individual is less than said allergenic immunogenic response produced by said polypeptide of interest, wherein said T-cell epitope is altered by having a terminal portion of said polypeptide of interest comprising said T-cell epitope replaced with a corresponding terminal portion of a homolog of said polypeptide of interest wherein said homolog does not comprise a T-cell epitope identical to said replaced T-cell epitope.**

14.(Twice amended) A cleaning composition, an animal feed composition, or a composition for treating a textile comprising the variant of **[claim1]** **claim 2**.



APPENDIX III - Clean Claim Set

1. Canceled

2.(Once amended) A reduced allergenic variant of a polypeptide of interest, wherein said polypeptide of interest is selected from the group consisting of a cellulase, lipase, endoglucosidase H, carbohydrase, reductase, oxidase, isomerase, transferase, kinase, phosphatase and a protease and said polypeptide of interest comprises a T-cell epitope, wherein said variant differs from said polypeptide of interest by having an altered T-cell epitope such that one or more amino acid residues of the T-cell epitope are altered and wherein an allergenic immunogenic response produced by said variant in an individual is less than said allergenic immunogenic response produced by said polypeptide of interest.

3. Canceled

4. Canceled

5.(Once amended) The variant of claim 2, wherein said polypeptide of interest is not recognized by said individual as endogenous to said individual.

6. Canceled

7.(Once amended) The variant of claim 2, wherein said T-cell epitope is altered with amino acid substitutions.

8.(Once amended) A reduced allergenic variant of a polypeptide of interest, wherein said polypeptide of interest is selected from the group consisting of a cellulase, lipase, endoglucosidase H, carbohydrase, reductase, oxidase, isomerase, transferase, kinase, phosphatase and a protease and said polypeptide of interest comprises a T-cell epitope, wherein said variant differs from said polypeptide of interest by having an altered T-cell epitope such that an allergenic immunogenic response produced by said variant in an individual is less than said allergenic immunogenic response produced by said polypeptide of interest,

wherein said T-cell epitope is altered by having a terminal portion of said polypeptide of interest comprising said T-cell epitope replaced with a corresponding terminal portion of a homolog of said polypeptide of interest wherein said homolog does not comprise a T-cell epitope identical to said replaced T-cell epitope.

9.(Reiterated) The variant of claim 8 wherein said variant comprises at least one less T-cell epitope than said polypeptide of interest and said homolog combined.

10.(Reiterated) The variant of claim 8 wherein said variant comprises at least two less T-cell epitopes than said polypeptide of interest and said homolog combined.

11. - 13 Canceled

14.(Twice amended) A cleaning composition, an animal feed composition, or a composition for treating a textile comprising the variant of claim 2.

15 - 28. Canceled

29.(New) The variant of claim 2, wherein said polypeptide of interest is a cellulase.

30.(New) The variant of claim 29, wherein the T-cell epitope of the polypeptide of interest corresponds to the amino acid sequence disclosed in SEQ ID NO. 222 or SEQ ID NO: 223.

31.(New) The variant of claim 2, wherein said polypeptide of interest is a lipase.

32.(New) The variant of claim 31, wherein the T-cell epitope of the polypeptide of interest corresponds to the amino acid sequence disclosed in SEQ ID NO: 225 or SEQ ID NO: 226.

33.(New) The variant of claim 2, wherein said polypeptide of interest is an endoglucosidase H.

34.(New) The variant of claim 33, wherein the T-cell epitope of the polypeptide of interest corresponds to the amino acid sequence disclosed in SEQ ID NO: 228.

35.(New) A reduced allergenic variant of a protease of interest, wherein said protease of interest comprises a T-cell epitope and said protease of interest is altered by having a terminal portion of said protease comprising said T-cell epitope replaced with a corresponding terminal portion of a homolog of said protease of interest wherein said homolog does not comprise a T-cell epitope identical to the replaced T-cell epitope of the protease of interest and wherein said variant produces a lessened allergenic response in an individual compared to the protease of interest.

36.(New) The variant of claim 35, wherein the protease of interest is a subtilisin

37.(New) The variant of claim 35, wherein the variant comprises the amino acid sequence of SEQ ID NO: 236.

38.(New) A cleaning composition, an animal feed composition, a contact lens cleaning solution or a composition for treating a textile comprising the variant of claim 8.

39.(New) A cosmetic care formulation for skin, hair or oral care comprising the variant of claim 2.

40.(New) A cosmetic care formulation for skin, her or oral care comprising the variant of claim 35.

41.(New) A reduced allergenic variant of a polypeptide of interest, wherein said polypeptide of interest is selected from the group consisting of a cellulase, lipase, endoglucosidase H, carbohydrase, reductase, oxidase, isomerase, transferase, kinase, phosphatase and a protease and said polypeptide of interest comprises a T-cell epitope,

wherein said variant differs from said polypeptide of interest by having an altered T-cell epitope such that at least two amino acid residues of the T-cell epitope are altered and

wherein an allergenic immunogenic response produced by said variant is less than an allergenic immunogenic response produced by said polypeptide of interest in an individual.

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Date: February 27, 2002



05100

PATENT TRADEMARK OFFICE



By:

Carol A. See
Carol A. See

PATENT
Docket No. GC527-C1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of)	
)	
Estell et al.)	Group Art Unit: 1644
)	
Serial No. 09/500,135)	Examiner: D. Saunders
)	
Filed: February 8, 2000)	
)	
For: Proteins Producing an Altered Immunogenic)	
Response and Methods of Making and Using)	
the Same)	

CHANGE OF ADDRESS

Commissioner for Patents
Washington, D.C. 20231

Sir:

Please direct all future communications in connection with the above-identified application to the following address:

Genencor International, Inc.
925 Page Mill Road
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USPTO CUSTOMER NO. 005100

Please amend the application to reflect this change.

Respectfully submitted,

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Date: February 27, 2002

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For: Proteins Producing an Altered Immunogenic)
Response and Methods of Making and Using)
the Same)

PETITION FOR EXTENSION OF TIME

Commissioner for Patents
Washington, D.C. 20231

Sir:

The following extension of time is requested to respond to the Office Action dated October 1, 2001:

one month to _____; the extension fee is \$110.00.

two months to March 1, 2002; the extension fee is \$400.00.

three months to _____; the extension fee is \$920.00.

four months to _____; the extension fee is \$1,440.00.

five months to _____; the extension fee is \$1,960.00.

The extended time for response does not exceed the statutory period.

☐ The shortened statutory period has been reset by an Advisory Action dated _____.

☒ Charge \$400.00 to Deposit Account No. 07-1048.



U.S. Serial No. 09/500,135

Page 2

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The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16 and 1.17 that may be required by this paper, and to credit any overpayment, to Deposit Account No. 07-1048 (Docket No. GC527-C1). A duplicate of this paper is enclosed.

Respectfully submitted,

Christopher L. Stone
Registration No. 35,696

Date: February 27, 2002

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